NEEDLE BUSHES

1 2 3 4 5 6 7

Needle bushes consist of a thin, heat treated outer ring formed from accurately controlled sheet steel encasing a set of needles. Bushes may have a full complement of needles retained in outer ring by their ends or by grease, others have needles retained in a cage which is prevented from moving laterally in the outer ring.

These bearings which occupy very little radial space are particularly economical to use and possess a high load capacity, relative to their size. They should be selected in preference to other bearings when conditions of mounting and operation permit.

When needle bushes are used without an inner ring and needles rotate on a shaft of suitable hardness they occupy minimum space and therefore provide a very satisfactory solution. Maximum load capacity is obtained with a shaft hardness under needles of atleast 650 HV. A lower hardness is acceptable if loads and required life permit, please consult NRB.

combine economy whilst also providing a high load capacity. This is obtained by the use of flat ended needles having a greater effective length.

Such bearings are useful for applications involving large quantities at very low cost and where the lack of retention of needles cannot constitute a risk, e.g. needles dislodging when shaft is fitted.

Caged needle bushes (figs. 5 and 6) are less susceptible to misalignment between the shaft and housing and are generally preferred in applications involving a vertical shaft under light to medium loads.

The relatively large volume of grease available in these bearings reduces the frequency of relubrication and may even permit lubrication for life in certain applications.

Caged needle bushes type DB…E (fig. 7) have a seal incorporated, thus dispensing with the need for separate

TYPES OF NEEDLE BUSHES – In metric dimensions – Without oil hole.

Full complement needle bushes				Caged needle bushes		
Retained needles		Grease-retained needles				
Open (fig. 1)	Closed end (fig. 2)	Open (fig. 3)	Closed end (fig. 4)	Open (fig. 5)	Closed end (fig. 6)	Open with (fig. 7)
DL DL...P	DLF DLF…P	SL SL…P	CN , CNS	DB DB…P	DBF DBF...P	DB...E DB...PE

Full complement needle bushes in inch dimensions open or with closed end (types JL or JLF) are also available. Please refer tables of dimensions.

Needle bushes with oil hole can be supplied where the quantities involved are large. Nevertheless, it may be necessary to supply bushes with oil hole if the standard type is not available.

Needle bushes with suffix P are manufactured to tolerances confirming to ISO standard 3245.

Hardened inner rings can be supplied for most NRB needle bushes. They remove the necessity to harden the shaft and enable the bearings to accept a full load capacity.

Needle bushes are normally supplied with rust preventive oil except where a special grease has been requested. Needle bushes SL, CN and CNS types where needles are retained by grease are supplied with grease.

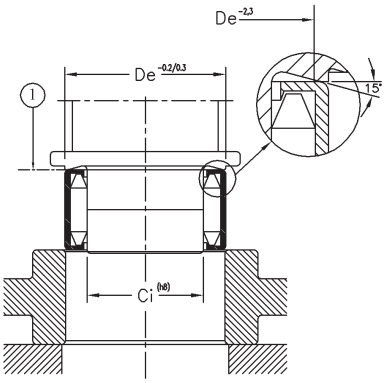
The full complement needle bush with needles retained in the outer ring (figs. 1 and 2) incorporate the advantages of low price high load capacity and ease of handling and fitting.

Full complement needle bushes with grease retained needles in the outer ring (figs. 3 and 4)

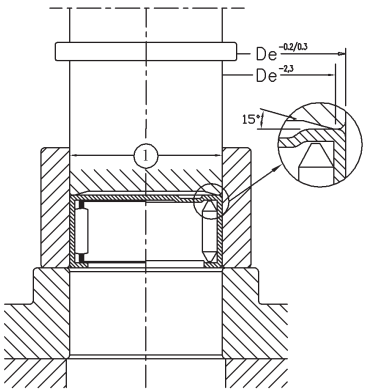
sealing rings. The seal lip design achieves a light and constant contact with inner raceway throughout the range of the mounted bearing clearances thereby ensuring positive sealing and low frictional drag.

Sealed drawn cup bearings are intended to retain grease or non-pressurized oil within a bearing while also preventing contaminants entering the raceway area.

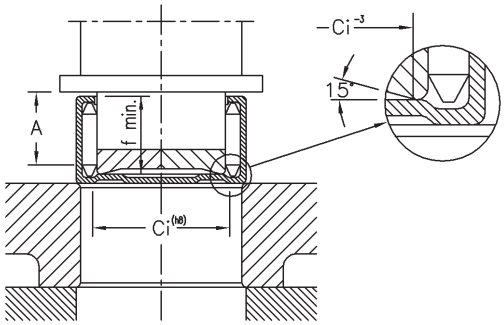
Closed end needle bushes (figs. 2,4,6) ensure perfect sealing at the end of a shaft and do not necessitate the use of blind housings or end caps. They are also able to support a small axial force transmitted by shaft. Where a large axial load requires the additional use of a thrust bearing, please consult NRB. The low price and minimal space occupied and the ease of installation of this bearing provide a very acceptable solution in many cases.



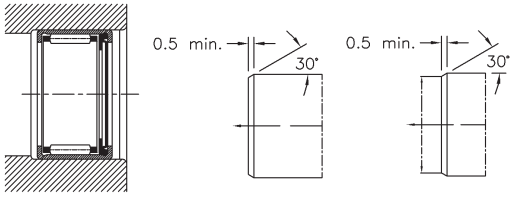
1) Marked Face



1) Bore Of Ring : De + 0.3mm



1) A min = f min + 1 mm



* For more details on inspection and installation please refer NRB brochure on Mounting & Dismounting and Inspection Procedure for NRB Needle Bushes

INSPECTION*

Needle bushes are not truly cylindrical in free state and therefore they can be inspected only after they have been fitted in a ring-gauge having sufficient thickness to withstand deformation and with a bore ground truly cylindrical. The sizes of these gauges, together with the tables of dimensions of " GO" and "NO-GO" plug gauges are given in the tables of dimensions. For needle bushes with suffix P inspection dimensions are in conformance with ISO standard 3245 which applies to a ring-gauge of tolerance N6. For needle bushes without suffix P inspection dimensions relate to ring-gauge of tolerance H6.

Because considerable tightening of the needle bush takes place in the ring gauge due to the interference fit, insertion and removal of the bush is likely to make it unsuitable for subsequent use. This method, which is the only valid way of correct inspection, can only be applied therefore to parts set aside for inspection.

INSTALLATION *

For needle bushes one must accept that the thin outer ring is interference fitted to the housing bore and will correspond closely to the shape of the housing. A housing with localised imperfections and thickness variations may cause deformation of the bush, which is detrimental to smooth operation. Best results are obtained with a geometrically uniform shape and even load distribution. The force required to insert needle bush must be applied without shock to the side marked with the bearing part number. Thus it is advisable to use a small press fitted with a suitable mandrel to apply uniform force to the bush centred in the housing (fig. 8).The axial movement of the mandrel should be limited by a shoulder coming against the face of the housing.

Bushes having one closed end should preferably have the open end presented to the housing bore (fig. 9) .If this is not possible, the force may be applied to the inside face of the closed end in the case of bushes type DLF (fig. 10). (This must not be done in the case of bushes type DBF).

CAGED NEEDLE BUSHES INCORPORATING SEALS

Caged needle bushes type DB...E (DB...PE) have a seal incorporated on the inside of the face marked with the bearing part number. To this face should be applied the force necessary for installation. Thus, after fitting, the seal will normally be situated towards the outside of the bearing to prevent loss of lubricant and the entry of dirt, etc (fig. 11). The bearing seal which is made of synthetic rubber permits operation upto 120°C. (Minimum running temperature -20° C)

The shaft to be introduced into the needle bush on assembly must be chamfered at its end or at its shoulder (fig. 12). When carrying out this operation the surface passing through the seal must be greased, in order to provide satisfactory sealing at commencement of operation.

INNER RINGS

Inner rings for needle bushes are normally supplied without oil hole and have a cylindrical needle track (series IM or IM...P). In those infrequent cases where lubrication is provided through the shaft inner rings can be supplied on request with oil hole (series IMC). Please consult NRB for details.

The inner rings with a slightly convex needle track series IM...R6 without oil hole are primarily intended for full complement needle bushes type DL as a means of extending the permissible misalignment tolerance upto 1 in 1 000 for continuous operation (instantaneous maximum: 2 in 1 000). Inner rings type IM...R6 must be correctly centred in relation to the bush (maximum permissible displacement: 5% of width L). For this reason these inner rings cannot be used with closed end bushes type DLF.

HOUSING TOLERANCES

Types of bush	Housing Dimension De	
	Steel or cast iron	Non-ferrous metal[1)] or thin casings in steel
JL , JLF	J6 (J7)	N6 (N7)
DL, DLF, DB, DBF, DB...E	H6 (H7)	M6 (M7)
DL...P, DLF...P DB...P, DBF...P, DB....PE	N6 (N7)	R6 (R7)

1 If a housing of non-ferrous metal reaches temperatures considerably higher (or lower) than 20° C, account should be taken of the difference in expansion (or contraction) of the bush and suitable adjustments to the fits should be made.

The cylindrical tolerance defined as the difference in radii of two coaxial cylinders (Recommendation R 1101) must normally be less than a quarter of the machining tolerance on the defined diameter. However, for precision applications or high speeds, it is recommended that the cylindrical tolerance is reduced to one eighth of the machining tolerance.

RADIAL PLAY

The fit of a bush in its housing determines to a large extent the dimension under the needles after fitting and consequently the radial play during operation.

The recommended shaft and housing tolerances give a radial play the limits of which are suitable for most normal applications. To obtain a closer clearance, it is possible to match the shaft diameters with the diameters under the needles of the bushes after the latter have been fitted into their housings.

The possible differences in the rigidity of housings and variations of clamping force resulting from the tolerance build up do not permit one to establish a range of dimensions under the needles for every application. However, for housings of very thick steel, taking into account the probable restraining force, the variations of the dimension under the needles after installation will be within the tolerances given below :

Types of bush	Tolerance of dimension under the needles after fitting	
DL..P, DLF...P DB...P, DBF...P, DB...PE	F8	
DL, DLF DB, DBF, DB...E	Dimension Ci 22 mm 25 - 40 mm 45 - 55 mm	 +15/+50 μm +20/+60 μm +20/+65 μm

The radial play limits should also take into account the tolerance of the shaft used directly as a raceway or the outer diameter of the inner ring after it has been fitted on to the shaft.

Where an inner ring is used on a shaft of recommended tolerance k5 (k6) or m5 (m6), the minimum play may be slightly lower and the maximum play slightly higher than for the case of an assembly without inner ring on a shaft of h5 (h6) tolerance.

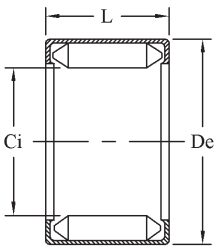
SHAFT TOLERANCE

Operating conditions	Needle bushes without inner ring	Dim. Ci	Needle bushes with inner ring	Dim. Ci
Rotating	All types except CN and CNS	h5 (h6)	All types except CN and CNS	k5 (k6)
Oscillating motion	All types except CN and CNS	J5 (J6)	All types except CN and CNS	m5 (m6)

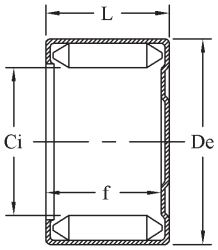
Needle Bushes with Full Complement, Retained Needle Rollers (Metric Sizes)

Type DL, DL...P

DLF, DLF...P



DL,DL...P

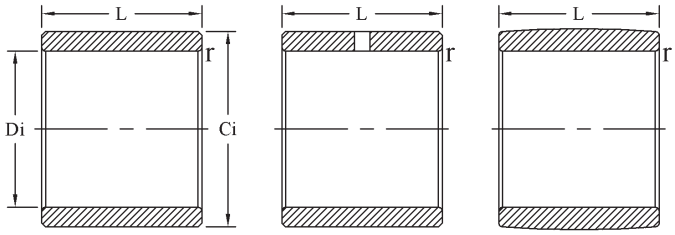


DLF,DLF...P

Shaft dia	Designation	Ci	Ce	L	f min	Basic capacities		Limiting speed (oil)	Approx. weight	
						Dynamic (C)	Static (Co)		DL	DLF
m m		m m	m m	m m	m m	Newtons	Newtons	rpm	gms	gms
6	DL,DLF 6 10	6.00	12.00	10.00	7.70	3900	3500	50000	4.20	4.40
8	DL 8 12 10	8.00	12.00	10.00		5300	6800		3.53	-
	DL,DLF 8 10	8.00	14.00	10.00	7.70	5600	5700	37500	5.30	5.60
9	DL,DLF 9 14 12	9.00	14.00	12.00	9.70	7200	9000	33000	6.10	6.50
10	DL 10 14 10 PA	10.00	14.00	10.00		5600	8000	32700	4.00	
	DL,DLF 10 12	10.00	16.00	12.00	9.70	7900	9400	30000	8.00	8.50
12	DL,DLF 12 10	12.00	18.00	10.00	7.70	6800	8100	25000	7.60	8.40
	DL,DLF 12 12	12.00	18.00	12.00	9.70	8900	11400	25000	9.40	10.20
13	DL,DLF 13 12	13.00	19.00	12.00	9.70	9300	12200	23000	9.90	10.90
14	DL,DLF 14 12	14.00	20.00	12.00	9.70	9700	13400	21500	10.50	11.60
15	DL,DLF 15 12 P	15.00	20.00	12.00	9.70	9700	15100	20500	10.00	
	DL,DLF 15 12	15.00	21.00	12.00	9.70	10100	14200	20000	11.00	12.20
16	DL,DLF 16 12	16.00	22.00	12.00	9.70	10500	15400	18500	12.00	13.40
17	DL,DLF 1712	17.00	23.00	12.00	9.70	10800	16200	17500	13.00	14.40
	DL,DLF 17 23 12 P	17.00	23.00	12.00	9.70	10800	16200	17500	13.00	14.40
18	DL,DLF 18 12	18.00	24.00	12.00	9.70	11200	17400	16500	14.00	16.00
	DL,DLF 18 16	18.00	24.00	16.00	13.70	15900	27300	16500	19.00	21.00
	DL,DLF 18 24 16 P	18.00	24.00	16.00	13.70	15900	27300	16500	19.00	21.00
20	DL,DLF 20 12	20.00	26.00	12.00	9.70	11800	19400	15000	15.00	17.00
	DL,DLF 20 14 P	20.00	26.00	14.00	11.70	14400	24900	15000	17.60	
	DL,DLF 20 16	20.00	26.00	16.00	13.70	16800	30400	15000	20.00	22.00
	DL,DLF 20 20 P	20.00	26.00	20.00	17.70	21400	41500	15000	27.00	
	DL,DLF 20 25 P	20.00	26.00	25.00	22.70	26700	55200	15000	33.80	
22	DL,DLF 22 16	22.00	28.00	16.00	13.70	17700	33500	13500	22.00	25.00
25	DL,DLF 25 32 25 P	25.00	32.00	25.00	22.70	32100	64200	12000	46.80	49.80
	DL,DLF 25 16	25.00	33.00	16.00	13.70	22100	36000	12000	35.00	39.00
	DL,DLF 25 20	25.00	33.00	20.00	17.70	26200	44400	12000	43.00	47.00
28	DL,DLF 28 20	28.00	36.00	20.00	17.70	30300	55800	11000	47.00	51.00
30	DL,DLF3016	30.00	38.00	16.00	13.70	24400	43200	10000	40.00	45.00
	DL,DLF 30 20	30.00	38.00	20.00	17.70	31400	59800	10000	50.00	55.00
	DL,DLF 30 25	30.00	38.00	25.00	22.70	39600	80500	10000	63.00	68.00
35	DL,DLF 35 42 16 P	35.00	42.00	16.00	13.70	21500	48000	8500	40.00	46.00
	DL,DLF 35 16	35.00	43.00	16.00	13.70	26600	50500	8500	46.00	53.00
	DL.DLF 35 20	35.00	43.00	20.00	17.70	34200	69800	8500	57.00	64.00
	DL 35 20 M	35.00	43.00	20.00		29700	61700	8600	112.00	
40	DL,DLF 40 16	40.00	48.00	16.00	13.70	24700	48000	7500	51.00	61.00
	DL,DLF 40 20	40.00	48.00	20.00	17.70	33100	70100	7500	64.00	74.00
44	DL,DLF 44 16	44.00	52.00	16.00	13.70	29900	63500	6800	56.00	66.00
45	DL,DLF 45 52 16 P	45.00	52.00	16.00	13.70	25800	63000	6500	48.00	58.00
47	DL,DLF 47 16	47.00	55.00	16.00	13.70	31000	67800	6400	60.00	71.00
50	DL,DLF 5012	50.00	58.00	12.00	9.70	19300	37600	6000	47.00	61.00
	DL,DLF 50 18	50.00	58.00	18.00	15.70	29600	65200	6000	71.00	85.00
	DL,DLF 50 20	50.00	58.00	20.00	17.70	37300	87700	6000	77.00	91.00
	DL,DLF 50 30	50.00	58.00	30.00	27.70	61600	167500	6000		135.00
55	DL,DLF 55 20	55.00	63.00	20.00	17.70	39100	96500	5500	86.00	102.00

Inner Rings

(1) Inner rings with lubrication hole, type IMC, available on request
(2) Inner ring with convex raceways cannot be used with needle bushes with closed end (Series DLF or DLF...P)



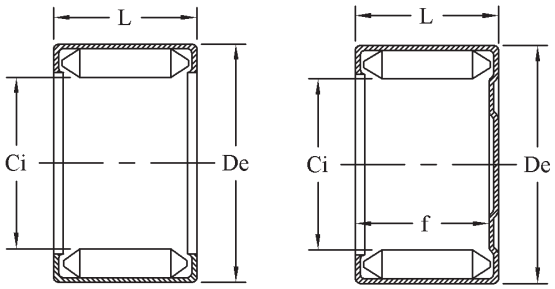
IM | IMC (1) | IM...R6 (2)

Inspection Gauges* Ring bore m m	GO Plug m m	NO GO Plug m m	Shaft dia m m	Designation	Di m m	Ci m m	L m m	r m m	Approx weight gms	Reference Needle Bush
12.000	6.009	6.036								
11.995	8.031	8.056								
14.000	8.009	8.036								
14.000	9.009	9.036								
13.995	10.031	10.056								
16.000	10.009	10.036								
18.000	12.009	12.035								
18.000	12.009	12.035	8.00	IM 8 12 12.4	8.00	12.00	12.40	0.30	5.80	DL,DLF 12 12
19.000	13.009	13.035	9.00	IM 9 13 12.4	9.00	13.00	12.40	0.30	6.40	DL,DLF 13 12
20.000	14.009	14.035	10.00	IM 10 14 12.4	10.00	14.00	12.40	0.30	7.00	DL,DLF 14 12
19.972	15.009	15.035								
21.000	15.009	15.035	12.00	IM 12 15 12.4	12.00	15.00	12.40	0.20	5.80	DL,DLF 15 12
22.000	16.009	16.035		IM 12 16 12.4	12.00	16.00	12.40	0.30	8.10	DL,DLF 16 12
23.000	17.009	17.035	13.00	IM 13 17 12.4	13.00	17.00	12.40	0.30	8.70	DL,DLF 17 12
22.976	17.016	17.034		IM 13 17 12.4	13.00	17.00	12.40	0.30	8.70	DL,DLF 17 23 12 P
24.000	18.009	18.035		IM 13 18 12.4	13.00	18.00	12.40	0.35	11.20	DL,DLF 18 12
24.000	18.009	18.035		IM 13 18 16.4	13.00	18.00	16.40	0.35	15.00	DL,DLF 18 16
23.976	18.016	18.034		IM 13 18 16.4	13.00	18.00	16.40	0.35	15.00	DL,DLF 18 24 16 P
26.000	20.009	20.035	15.00	IM 15 20 12.4	15.00	20.00	12.40	0.35	12.70	DL,DLF 20 12
25.972	20.009	20.035								
26.000	20.009	20.035		IM 15 20 16.4	15.00	20.00	16.40	0.35	17.00	DL,DLF 20 16
25.972	20.009	20.035								
25.972	20.009	20.035								
28.000	22.009	22.035	17.00	IM 17 22 16.4	17.00	22.00	16.40	0.35	18.80	DL,DLF 22 16
31.967	25.015	25.041								
33.000	25.015	25.041	20.00	IM 20 25 16.4	20.00	25.00	16.40	0.35	21.50	DL,DLF 25 16
33.000	25.015	25.041		IM 20 25 20.4	20.00	25.00	20.40	0.35	27.00	DL,DLF 25 20
36.000	28.015	28.041	23.00	IM 23 28 20.4	23.00	28.00	20.40	0.35	30.50	DL,DLF 28 20
38.000	30.015	30.041	25.00	IM 25 30 16.4	25.00	30.00	16.40	0.35	26.50	DL,DLF 30 16
38.000	30.015	30.041		IM 25 30 20.4	25.00	30.00	20.40	0.35	33.00	DL,DLF 30 20
38.000	30.015	30.041		IM 25 30 25	25.00	30.00	25.00	0.35	40.00	DL,DLF 30 25
41.972	35.025	35.050	30.00	IM 30 35 16.4	30.00	35.00	16.40	0.35	31.00	DL,DLF 35 42 16 P
43.000	35.015	35.041		IM 30 35 16.4	30.00	35.00	16.40	0.35	31.00	DL,DLF 35 16
43.000	35.015	35.041		IM 30 35 20.4	30.00	35.00	20.40	0.35	39.00	DL,DLF 35 20
43.000	35.015	35.041								
48.000	40.015	40.041	35.00	IM 35 40 16.4	35.00	40.00	16.40	0.35	36.00	DL,DLF 40 16
48.000	40.015	40.041		IM 35 40 20.4	35.00	40.00	20.40	0.35	45.00	DL,DLF 40 20
52.000	44.015	44.041	40.00	IM 40 44 16.4	40.00	44.00	16.40	0.30	32.00	DL,DLF 44 16
51.967	45.025	45.050		IM 40 45 16.4 P	40.00	45.00	16.40	0.30	32.00	DL,DLF 45 52 16 P
55.000	47.015	47.041								
58.000	50.015	50.041								
58.000	50.015	50.041								
58.000	50.015	50.041	45.00	IM 45 50 20.4	45.00	50.00	20.40	0.60	56.00	DL,DLF 50 20
57.967	50.013	50.043								
63.000	55.015	55.041	50.00	IM 50 55 20.4	50.00	55.00	20.40	0.60	62.00	DL,DLF 55 20

* This inspection renders a bush unfit for further use

Needle bushes with Full Complement, Retained Needle Rollers (JL Sizes)

Type JL, JLT
JLF, JLFT

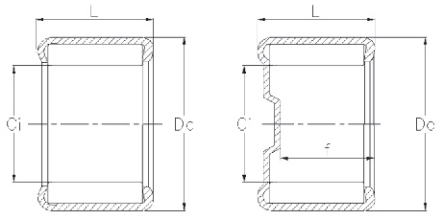


JL, JLT JLF, JLFT

Shaft dia	Designation	Ci	Ce	L	f min	Basic capacities Dynamic C	Basic capacities Static Co	Limiting speed (oil)	Approx. wt JL JLT	Approx. wt JLF JLFT	Inspection Gauges* Ring bore	Inspection Gauges* Go Plug	Inspection Gauges* NO Go Plug
m m		m m	m m	m m	m m	Newtons	Newtons	rpm	gms	gms	m m	m m	m m
7.94	JL 59	7.94	12.70	14.3		8700	10600	37700	6.50		12.71	7.975	8.001
9.525	JL,JLF 6 6	9.525	14.288	9.525	7.366	5400	6800	31500	5.00	5.50	14.2748	9.5402	9.5631
	JL,JLF 6 8	9.525	14.288	12.70	10.414	7800	10900	31500	6.00	7.00	14.2748	9.5402	9.5631
	JL6 10	9.525	14.288	15.875		9800	14800	31500	7.30		14.2748	9.5631	9.5885
11.112	JL,JLF 78	11.112	15.875	12.70	10.414	8400	12500	27000	7.30	8.50	15.8623	11.1277	11.1506
	JLF 78	11.112	15.875	12.70	10.5	8400	12500	27000			15.862	11.121	11.148
12.70	JL,JLF 8 5	12.70	17.462	7.938	5.7912	4500	5800	23500	5.00	6.20	17.4498	12.7152	12.7381
	JL 8 6 A	12.70	17.462	9.52		6670	9800	23600	5.00		17.475	12.738	12.761
	JL 8 6	12.70	17.462	9.525		10500	17500	23600	5.80		17.4498	12.7127	12.7381
	JL,JLF 8 8	12.70	17.462	12.70	10.414	9000	14300	23600	8.20	9.10	17.4498	12.7152	12.7381
	JL,JLF 8 10	12.70	17.462	15.875	13.716	11800	20200	23600	10.90	11.80	17.4498	12.7152	12.7381
	JLT,JLFT 8 10	12.70	19.05	15.875	13.208	13700	19500	23600	14.50	15.80	19.0373	12.7152	12.7381
	JL,JLF 8 12	12.70	17.462	19.05	16.764	14100	25400	23600	13.20	14.10	17.4498	12.7152	12.7381
	JLT,JLFT 8 12	12.70	19.05	19.05	16.51	16900	24600	23600	17.60	19.00	19.0373	12.7152	12.7381
14.287	JL 9 8	14.287	19.05	12.70		10100	17350	21000	10.00		19.063	14.326	14.349
14.288	JL,JLF 9 5	14.288	19.05	7.938	5.842	5200	7000	21000	5.00	6.00	19.0373	14.3027	14.3256
	JL,JLF 9 12	14.288	19.05	19.05	16.764	15200	28900	21000	15.00	16.00	19.0373	14.3027	14.3256
	JLT,JLFT 9 12 †	14.288	20.638	19.05	16.51	16600	25600	21000	19.50	20.80	20.6248	14.3027	14.3256
15.875	JL,JLF 10 5	15.875	20.638	7.938	5.842	5400	7900	18900	5.90	7.70	20.6248	15.8902	15.9131
	JL 10 7 A	15.875	20.638	11.13		9200	15800	18900	8.00		20.65	15.913	15.936
	JL,JLF 10 8	15.875	20.638	12.70	10.414	10200	17900	18900	10.00	11.80	20.6248	15.8902	15.9131
	JL,JLF 10 12	15.875	20.638	19.05	16.764	15900	31800	18900	16.00	18.00	20.6248	15.8902	15.9131
	JLT,JLFT 10 12	15.875	22.225	19.05	16.51	17800	27900	18900	21.40	23.20	22.2123	15.8902	15.9131
	JLT,JLFT 10 16	15.875	22.225	25.40	22.86	25300	45300	18900	29.50	31.40	22.2123	15.8902	15.9131
17.462	JL,JLF 11 8	17.462	22.225	12.70	10.414	10900	20100	17100	11.00	14.00	22.2123	17.4777	17.5006
	JL,JLF 11 10	17.462	22.225	15.875	13.208	14000	27800	17100	15.00	16.00	22.2123	17.4777	17.5006
17.463	JL 11 6	17.463	22.225	9.52		7960	13500	17100	9.00		22.2377	17.5006	17.524
	JL 11 8	17.463	22.225	12.70		11600	21800	17100	11.00		22.2377	17.5006	17.524
19.05	JL 126	19.05	25.40	9.525		7700	10100	15700	10.20		25.3873	19.0627	19.0881
	JL 12 8	19.05	25.40	12.70		12400	18300	15700	13.90		25.3873	19.0627	19.0856
	JL,JLF 12 10	19.05	25.40	15.875	13.208	16500	26700	15700	20.00	23.00	25.3873	19.0627	19.0881
	JL,JLF 12 12	19.05	25.40	19.05	16.51	20400	35000	15700	25.00	27.70	25.3873	19.0627	19.0881
20.638	JL,JLF 13 16	20.638	28.575	25.40	22.86	29700	58100	14500	37.00	40.00	26.9748	20.6502	20.6756
22.225	JL,JLF 14 8	22.225	28.575	12.70	10.16	13400	22300	13500	18.20	23.30	28.5623	22.2377	22.2631
	JL,JLF 14 12	22.225	28.575	19.05	16.51	21800	41800	13500	28.60	32.70	28.5623	22.2377	22.2631
	JL,JLF 14 16	22.225	28.575	25.40	22.86	29300	61300	13500	40.90	43.20	28.5623	22.2377	22.2631
	JLT,JLFT 14 10	22.225	20.638	15.875	12.70	18400	28800	13500	30.40	35.40	30.1498	22.2377	22.2631
25.4	JL,JLF 16 8	25.40	31.75	12.70	10.414	14400	25400	11800	20.00	25.00	31.7373	25.4127	25.4381
	JL,JLF 16 12	25.40	31.75	19.05	16.891	23400	47600	11800	32.00	37.00	31.7373	25.4127	25.4381
	JL,JLF 16 16	25.40	31.75	25.40	23.1902	31600	69900	11800	44.00	49.00	31.7373	25.4127	25.4381
	JLT,JLFT 16 12 †	25.40	33.338	19.05	16.002	25900	44900	11800	39.90	45.30	33.3248	25.4127	25.4381
	JLT,JLFT 16 16	25.40	33.338	25.40	22.352	35400	44900	11800	54.90	59.80	33.3248	25.4127	25.4381
	JLT,JLFT 16 24	25.40	33.338	38.10	35.052	52600	111600	11800	85.30	90.70	33.3248	25.4127	25.4381
28.575	JL,JLF 18 8	28.575	34.925	12.70	10.414	15300	28500	10500	23.00	28.00	34.9123	28.5877	28.6131
	JL,JLF 18 12	28.575	34.925	19.05	16.891	25000	53500	10500	36.00	41.00	34.9123	28.5877	28.6131
	JL,JLF 18 16	28.575	34.925	25.40	23.1902	41400	102200	10500	49.00	54.00	34.9123	28.5877	28.6131
	JLT,JLFT 18 12 †	28.575	38.10	19.05	15.494	31300	51900	10500	55.30	62.10	38.0873	28.5877	28.6131
	JLT,JLFT 18 16 †	28.575	38.10	25.40	21.844	41400	74300	10500	74.80	81.60	38.0873	28.5877	28.6131
31.75	JL,JLF 20 8	31.75	38.10	12.70	10.16	16200	32000	9400	25.00	31.00	38.0873	31.7627	31.7881
	JL,JLF 20 12	31.75	38.10	19.05	16.891	26300	59900	9400	39.00	45.00	38.0873	31.7627	31.7881
	JL,JLF 20 16	31.75	38.10	25.40	22.86	35400	87700	9400	53.60	60.00	38.0873	31.7627	31.7881
	JL,JLF 20 20	31.75	38.10	31.75	29.21	46200	117400	9400	68.20	74.50	38.0873	31.7627	31.7881
34.925	JL,JLF 22 8	34.925	41.275	12.70	10.16	17100	33700	8500	26.80	33.60	41.2623	34.9377	34.9656
	JL,JLF 22 16	34.925	41.275	25.40	22.86	38200	94900	8500	53.60	61.00	41.2623	34.9377	34.9656
	JL,JLF 22 20	34.925	41.275	31.75	29.21	48200	124900	8500	74.50	82.70	41.2623	34.9377	34.9656
38.10	JL,JLF 24 14	38.10	47.625	22.225	18.796	41900	82500	7800	80.90	90.50	47.6123	38.1127	38.1432
	JL,JLF 24 16	38.10	47.625	25.40	21.844	49800	103100	7800	92.50	102.00	47.6123	38.1127	38.1432
	JL,JLF 24 20	38.10	47.625	31.75	28.194	62000	136500	7800	121.00	130.50	47.6123	38.1127	38.1432
44.45	JL,JLF 28 16	44.45	53.975	25.40	21.844	53300	119600	6700	109.00	122.50	53.9623	44.4627	44.4957
	JL,JLF 28 24	44.45	53.975	38.10	34.544	78800	197700	6700	172.00	188.50	53.9623	44.4627	44.4957

* This inspection renders a bush unfit for further use
† JLT, JLFT are equivalent to RL, RLF respectively.

Needle Bushes with Full Complement Grease-retained Needle Rollers (Metric sizes)



SL CN

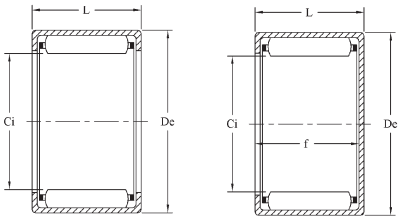
Open end type : SL

Shaft dia	Designation	Ci	Ce	L	f min	Basic capacities Dynamic C	Basic capacities Static Co	Limiting speed (oil)	Approx weight	Inspection Gauges* Ring bore	Go Plug	NO Go Plug
m m		m m	m m	m m	m m	Newtons	Newtons	rpm	gms	m m	m m	m m
8	SL 8 12 8 P	8.00	12.00	8.00	-	4900	6300	18750	3.20	11.980	8.013	8.031
9	SL 9 14 12	9.00	14.00	12.00	-	9000	11600	44000	6.40	13.980	9.013	9.028
12	SL 12 20 12	12.00	20.00	12.00	-	12900	15000	25500	15.00	20.000	12.015	12.041
12	SL 12 20 14	12.00	20.00	14.00	27.80	15000	18300	25000	16.50	20.000	12.015	12.041
16	SL 16 22 8.5 P	16.00	22.00	8.50	-	8300	11500	18500	8.00	21.976	16.020	16.038
18	SL18 16P	18.00	24.00	16.00	-	18100	32300	16500	19.80	23.972	18.009	18.035
19.05	SL 90 028	19.05	34.15	6.35	-	11300	8100	12500	21.58	34.125	19.070	19.091
28	SL 28 35 16	28.00	35.00	16.00	-	25100	25400	4000	34.76	34.972	28.020	28.041
32	SL 32 20	32.00	40.00	20.00	-	36100	72800	12000	57.10	39.987	32.010	32.025
35	SL 90 038	35.00	42.00	29.00	-	35100	84900	3200	63.54	41.972	35.025	35.037
35	SL 35 20	35.00	43.00	20.00	-	41100	88400	8500	53.09	43.000	35.015	35.041
35	SL 35 43 23.5 PEE*, ^	35.00	43.00	23.50	-	38200	82100	11400	67.45	42.972	35.025	35.050
45	SL 45 52 22 P	45.00	52.00	22.00	-	41800	115600	6500	75.00	51.967	45.025	45.038
45	SL 90 041	45.00	52.00	31.00	-	41800	115600	2500	48.20	51.967	45.025	45.038
50	SL 50 58 25 P	50.00	58.00	25.00	-	56600	154500	6000	105.00	57.967	50.020	50.030
50	SL 90 043	50.00	58.00	34.00	-	55000	155000	3000	120.53	57.967	50.020	50.030

Closed end type : CN

Shaft dia	Designation	Ci	Ce	L	f min	Basic capacities Dynamic C	Basic capacities Static Co	Limiting speed (oil)	Approx weight	Inspection Gauges* Ring bore	Go Plug	NO Go Plug
m m		m m	m m	m m	m m	Newtons	Newtons	rpm	gms	m m	m m	m m
7	CN 7 14 12 P	7.00	14.00	12.00	10.80	8200	8000	42800	7.028	13.980	7.013	7.028
10	CN 47 363	10.00	15.00	9.35	7.60	5900	8400	30000	6.500	15.016	10.011	10.260
12	CN 12 10	12.00	18.00	9.95	8.40	8600	11000	25000	9.000	18.016	12.009	12.035
13	CN 90001	13.00	19.00	11.85	9.60	10000	14300	23000	12.700	19.020	13.013	13.031
18	CN 18 13	18.00	24.00	12.80	-	14200	23600	16500	22.000	24.021	18.007	18.033
18	CN 90 040	18.00	24.00	13.50	11.25	13400	23000	16500	11.250	24.020	18.013	18.031

Note: Closed end shape may differ from size to size, therefore please consult NRB



JV JVF

Needle Bushes with Cage - Guided Needle Rollers (Inch Sizes)

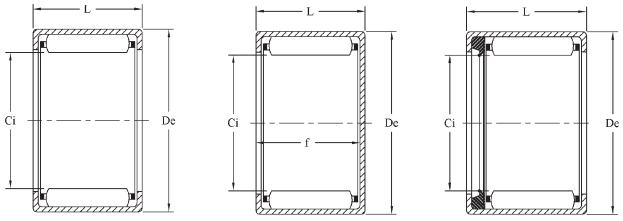
Type : JV, JVF

Shaft dia	Designation	Ci	Ce	L	f min	Basic capacities Dynamic C	Basic capacities Static Co	Limiting speed (oil)	Approx weight JV	Approx weight JVF	Inspection Gauges* Ring bore	Go Plug	NO Go Plug
m m		m m	m m	m m	m m	Newtons	Newtons	rpm	gms	gms	m m	m m	m m
9.525	JV 6 5	9.525	14.275	7.92	-	2500	2500	42000	3.65	-	14.300	9.563	9.586
19.050	JV 12 6	19.050	25.410	9.52	-	6400	8000	21000	10.43	-	25.387	19.063	19.088
22.225	JV 14 6.1	22.225	28.575	9.51	-	6800	9000	18000	11.70	-	28.562	22.238	22.263
23.355	JV 90 033	23.355	29.745	9.00	-	8500	13000	17100	12.58	-	29.745	23.400	23.421
25.400	Jv166	25.400	31.750	9.53	-	7100	10100	15500	13.20	-	31.737	25.413	25.438
28.575	JV, JVF 18 8	28.575	34.925	12.70	10.414	10700	17700	14000	20.90	25.50	34.912	28.588	28.613
31.723	JV 20 12	31.723	38.074	19.05	-	19100	38400	12600	35.24	-	38.087	31.764	31.790
31.723	JV 20 16	31.723	38.074	25.40	-	24500	52800	12600	46.16	-	38.087	31.764	31.790
41.160	JV 90 019	41.160	49.319	16.08	-	24500	42500	9000	46.80	-	49.294	41.175	41.201

* This inspection renders a bush unfit for further use
^ Please consult NRB for dimensions of inspection gauges

Needle Bushes with Caged-Guided Needle Rollers (Metric sizes)

Type DB, DB…P
DBF, DBF…P
DB….E, DB…PE



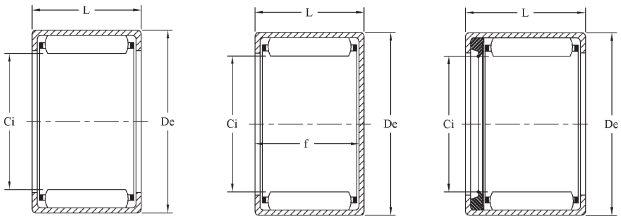
DB,DB...P DBF,DBF...P DB...E,DB...PE

Shaft dia	Designation	Ci	Ce	L	f min	Basic capacities Dynamic C	Basic capacities Static Co	Limiting speed (oil)	Approx weight DB	Approx weight DBF	Inspection Gauges* Ring bore	Inspection Gauges* Go Plug	Inspection Gauges* NO Go Plug
m m		m m	m m	m m	m m	Newtons	Newtons	rpm	gms	gms	m m	m m	m m
5	DB 5 8.5 7 P	5	8.5	7	-	1300	1500	80000	1.30	-	8.484	5.01	5.028
6	DB6 10 8 P	6	10	8	-	1650	2030	66000	2.08	-	9.984	6.01	6.028
7	DB,DBF 7 11 9 P	7	11	9	7.9	2900	3000	57000	2.70	2.90	10.98	7.013	7.031
8	DB,DBF 8 12 8 P	8	12	8	6.9	2700	2800	50000	2.60	2.80	11.98	8.013	8.031
	DB,DBF 8 12 10 P	8	12	10	8.9	3600	4100	50000	3.20	3.40	11.98	8.013	8.031
	DB,DBF 8 10 P	8	12	10	8.9	3600	4100	50000	3.20	3.40	11.977	8.009	8.035
9	DB,DBF 9 13 10 P	9	13	10	8.9	4000	4800	44000	3.50	3.80	12.98	9.013	9.031
	DB,DBF 9 10 P	9	13	10	8.9	4000	4800	44000	3.50	3.80	12.977	9.001	9.036
	DB,DBF 9 13 12 P	9	13	12	10.9	4900	6300	44000	4.10	4.40	12.98	9.013	9.031
	DB9 16 12 PE	9	16	12	-	4600	3900	50000	8.00	-	15.98	9.013	9.031
	DBF 90 050 P	9	16	13.9	9.085	3800	4600	44000	-	-	15.98	9.013	9.031
9.551	DBF 90 042 PE	9.551	14.808	10.16	8.735	2500	2500	33000	-	3.45	14.808	9.563	9.586
10	DB,DBF 10 14 10 P	10	14	10	8.9	4200	5200	40000	3.90	4.20	13.98	10.013	10.031
	DB,DBF 10 10 P	10	14	10	8.9	4200	5200	40000	3.90	4.20	13.977	10.009	10.036
	DB 10 14 12 P	10	14	12	-	5100	6800	40000	4.70	-	13.98	10.013	10.031
	DBF 90 051 PE	10	14	13.3	11.4	4300	5400	32000	-	5.95	13.98	10.013	10.031
	DB 90 020	10	14	15	-	6900	8800	40000	6.00	-	13.977	10.005	10.02
	DB 10 14 15 P	10	14	15	-	6000	8400	40000	5.70	-	13.98	10.013	10.031
	DBF 90 058	10	14	15	14	6000	8400	40000	6.15	-	13.977	10.026	10.044
	DBF 90 070P	10	14	14	10.9	5100	6800	40000	-	5.16	13.98	10.013	10.031
	DBF10 14 15 P.1	10	14	15	13.6	6000	8400	40000	6.19	-	13.98	10.013	10.031
	DBF 10 14 15 P	10	14	15	14	6000	8400	40000	-	-	13.98	10.013	10.031
	DB 10 14.5 12 P	10	14.5	12	-	3900	4800	40000	5.54	-	14.48	10.013	10.031
	DB 90 005	10	15	15	-	7100	8600	40000	7.50	-	15	9.972	9.99
	DBF 10 15 15 PE	10	15	15	14.25	5000	6600	32000	-	7.50	14.966	9.963	9.981
	DB 90 045 P	10	15	15	-	6900	8400	40000	6.00	-	15	10.01	10.031
	DB,DBF 10 12	10	16	12	10.5	5700	6000	40000	7.50	8.20	16	10.009	10.036
	DB 90 021	10	17	15	-	7300	6800	40000	9.00	-	16.992	10.005	10.02
12	DB,DBF 12 16 10 P	12	16	10	8.9	4700	6400	33000	4.50	5.00	15.98	12.016	12.034
	DB,DBF 12 10 P	12	16	10	8.9	5200	5400	33000	4.50	5.00	15.977	12.009	12.035
	DBF 90 032	12	16	14	10.9	5800	8400	33000	6.12	-	15.98	12.016	12.034
	DB,DBF 12 10	12	18	10	8.5	3900	5000	33000	7.00	7.80	18	12.009	12.035
	DB,DBF 12 18 12 P	12	18	12	10.5	6500	7600	33000	8.70	9.50	17.98	12.016	12.034
	DB,DBF 12 12 P	12	18	12	10.5	6500	7600	33000	8.70	9.50	17.977	12.009	12.035
	DB,DBF 12 12	12	18	12	10.5	6300	7300	33000	8.70	9.50	18	12.009	12.035
	DB 12 18 16 PEE	12	18	16	-	6000	7300	33300	11.70	-	17.98	12.016	12.034
	DB 12 18 14 PE**	12	18	14	-	6500	7500	33000	9.72	-	17.98	12.016	12.034
13	DB,DBF 13 19 12 P	13	19	12	10.5	6800	8200	31000	9.20	10.00	18.976	13.016	13.034
	DB.DBF 13 12	13	19	12	10.5	6800	8100	31000	9.20	10.00	19	13.009	13.035
	DBF 90 002	13	19	12	9.6	6800	8200	31000	9.20	10.40	18.976	13.016	13.034
	DB 13 19 14 PE	13	19	14	-	6300	7900	30500	10.80	-	18.976	13.016	13.034
	DB 1320 12 P	13	20	12	-	7400	8400	30800	10.00	-	19.976	13.016	13.034
13.5	DB 13.5 19 12 P	13.5	19	12	-	6600	8500	29000	8.66	-	19.021	13.485	13.51
14	DB,DBF 14 20 12 P	14	20	12	10.5	7500	9500	29000	9.80	10.70	19.976	14.016	14.034
	DB,DBF 14 12 P	14	20	12	10.5	11800	18200	29000	9.80	10.70	19.972	14.009	14.035
	DB,DBF 14 12	14	20	12	10.5	6900	8500	29000	9.80	10.70	20	14.009	14.035
	DB,DBF 14 20 16 P	14	20	16	14.5	10300	14300	29000	13.00	13.90	19.976	14.016	14.034
	DB 142031 PE	14	20	31	-	12200	17800	28600	26.00	-	19.976	14.016	14.034
	DB 14 20 12 P.1	14	20	12	-	7100	8500	29000	10.15	-	19.976	14.016	14.034
15	DB,DBF 15 21 12 P	15	21	12	10.5	7500	9600	27000	10.50	11.50	20.976	15.016	15.034
	DB,DBF 15 12 P	15	21	12	10.5	7400	9400	27000	10.50	11.50	20.972	15.009	15.035
	DB,DBF15 12	15	21	12	10.5	7400	9400	27000	10.50	11.50	21	15.009	15.035
	DB 1521 14 PE **	15	21	14	-	7500	9600	13000	11.30	-	20.976	15.016	15.034
	DB,DBF15 21 16 P	15	21	16	14.5	10500	15000	27000	14.40	15.70	20.976	15.016	15.034
	DB 15 21 18 PE **	15	21	18	-	10500	15000	13000	15.20	-	20.976	15.016	15.034
	DB 15 21 24 PE **	15	21	24	-	12400	18400	13000	20.20	-	20.976	15.016	15.034
16	DB,DBF16 22 12 P	16	22	12	10.5	7800	10300	25000	11.00	12.30	21.976	16.016	16.034
	DB,DBF 16 12 P	16	22	12	10.5	7800	10300	25000	11.00	12.30	21.972	16.009	16.035
	DB 16 22 14 PE	16	22	14	-	7800	10300	25000	12.00	-	21.976	16.016	16.034
	DBF 47 730	16	22	14.3	12.8	7800	10300	25000	-	14.20	22.021	16.005	16.031

* This inspection renders a bush unfit for further use
** Needle Bush with seal on one end

Needle Bushes with Caged-Guided Needle Rollers (Metric sizes)

Type DB, DB…P
DBF, DBF…P
DB….E, DB…PE



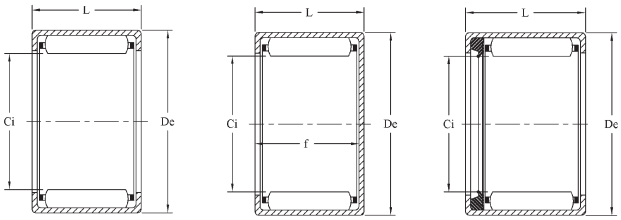
DB,DB...P DBF,DBF...P DB...E,DB...PE

Shaft dia	Designation	Ci	Ce	L	f min	Basic capacities Dynamic C	Basic capacities Static Co	Limiting speed (oil)	Approx weight DB	Approx weight DBF	Inspection Gauges* Ring bore	Inspection Gauges* Go Plug	Inspection Gauges* NO Go Plug
m m		m m	m m	m m	m m	Newtons	Newtons	rpm	gms	gms	m m	m m	m m
16	DB 16 22 16 P	16	22	16		11000	16100	25000	14.70	-	21.976	16.016	16.034
	DBF 90 027	16	22	16	14.5	8800	12800	25000		16.00	21.976	16.016	16.034
	DBJ 90 036	16	22	27		16700	25900	25000	28.00	-	21.976	16.016	16.034
	DBJ 16 22 27 P	16	22	27	-	24800	14600	25000	28.00		21 .9760	16.016	16.034
17	DB,DBF 17 23 12 P	17	23	12	10.5	8000	11000	24000	11.60	13.00	22.976	17.016	17.034
	DB,DBF 17 12 P	17	23	12	10.5	7600	10000	24000	11.60	13.00	22.972	17.009	17.035
	MNJ 671†	17	23.825	17.53	16	7400	8600	24000	20.00	-	23.825	17.038	17.064
	DB 17 25 18 PE	17	25	18	-	11900	14800	23500	24.00	-	24.976	16.992	17.01
	DB 17 25 20 PEE††	17	25	20	-	11900	14800	11700	25.00	-	24.976	17.016	17.034
18	DB,DBF 18 24 12	18	24	12	10.5	8300	11600	22000	12.70	14.30	23.976	18.016	18.034
	DB,DBF 18 12 P	18	24	12	10.5	10500	7800	22000	12.70	14.30	23.972	18.009	18.035
	DB,DBF 18 24 16 P	18	24	16	14.5	11800	18200	22000	17.00	18.60	23.976	18.016	18.034
	DB,DBF 18 16 P	18	24	16	14.5	11800	18200	22000	17.00	18.60	23.972	18.009	18.035
	DB,DBF 18 16	18	24	16	14.5	11400	17600	22000	17.00	18.60	24	18.009	18.035
	DB 90 059	18	24	24	-	2700	1150	22200	20.84	-	23.98	18.016	18.034
20	DB,DBF 20 26 20 P	20	26	20	8.5	6300	8500	20000	11.50	13.50	25.976	20.02	20.041
	DB,DBF 20 26 12 P	20	26	12	10.5	8800	13000	20000	13.80	15.80	25.976	20.02	20.041
	DB,DBF 20 12 P	20	26	12	10.5	8800	13000	20000	13.80	15.80	25.972	20.009	20.035
	DB,DBF 20 12	20	26	12	10.5	8400	12300	20000	13.80	15.80	26	20.009	20.035
	DB 20 26 14 PE	20	26	14		8600	12100	16000	5.10	-	25.976	20.02	20.041
	DB,DBF 20 26 16 P	20	26	16	14.5	12500	20300	20000	18.40	20.40	25.976	20.02	20.041
	DB,DBF 20 16 P	20	26	16	14.5	12500	20300	20000	18.40	20.40	25.972	20.009	20.035
	DB,DBF 20 16	20	26	16	14.5	12500	20300	20000	18.40	20.40	26	20.009	20.035
	DBF 20 26 18 PE	20	26	18	15.3	11300	19000	10000		20.50	25.976	20.02	20.041
	DB 20 26 20 P	20	26	20	-	14500	26200	20000	18.00	-	25.976	20.02	20.041
	DB 20 27 20 P	20	27	20		16900	27500	20000	28.00		26.976	20.02	20.041
	DB 20 27 20 P.1	20	27	20	-	16900	27500	20000	27.80	-	26.976	20.02	20.041
	DBF 90007	20	28	20	18.7	14600	20100	20000		33.00	27.976	20.02	20.041
	DB 20 29 18 PE**	20	29	18	-	13200	16000	10000	31.50	-	28.976	20.01	20.031
21	DB 21 28 10P	21	28	10	-	7100	9000	19000	13.00		27.976	21.02	21.041
22	DB,DBF 22 28 12 P	22	28	12	10.5	9300	14400	18000	15.00	18.00	27.976	22.02	22.041
	DB 22 28 12 PE **	22	28	12		6000	8700	18200	15.00	19.00	27.976	22.02	22.041
	DB,DBF 22 12 P	22	28	12	10.5	9300	14400	18000	15.00	18.00	27.972	22.009	22.035
	DB 22 28 14 PE	22	28	14		8400	13400	18200	16.00		27.976	22.02	22.041
	DB 22 28 16 PEE††	22	28	16		8400	13400	18200	20.00		27.976	22.02	22.041
	DB,DBF 22 28 16 P	22	28	16	14.5	13200	22500	18000	20.00	23.00	27.976	22.02	22.041
	DB,DBF 22 16 P	22	28	16	14.5	13200	22500	18000	20.00	23.00	27.972	22.009	22.035
	DB,DBF 22 16	22	28	16	14.5	13200	22500	18000	20.00	23.00	28	22.009	22.035
	DB 22 28 10 P.1	22	28	10	-	6400	9500	18000	12.20	-	27.976	22.02	22.041
	DB 22 29 30	22	29	30	-	23500	43000	18200	40.00	-	28.991	22.007	22.028
25	DB 25 32 12 P	25	32	12	-	9900	14700	16000	19.70		31.972	25.02	25.041
	DB,DBF 25 16 P	25	32	16	14.5	14900	18900	16000	26.00	29.00	31.967	25.015	25.041
	DB 25 32 18 P	25	32	18	-	14300	23800	16000	30.00	-	31.972	25.02	25.041
	DB 25 32 18 PE	25	32	18		13700	22400	16000	28.30	-	31 .9720	25.02	25.041
	DB,DBF 25 32 20 P	25	32	20	18.5	18900	32500	16000	32.00	35.00	31.972	25.02	25.041
	DB,DBF 25 20 P	25	32	20	18.5	18700	32000	16000	32.00	35.00	31.967	25.015	25.041
	DB,DBF 25 16	25	33	16	14.5	15400	22200	16000	30.00	34.00	33	25.015	25.041
	DB,DBF 25 20	25	33	20	18.5	20400	32000	16000	37.00	41.00	33	25.015	25.041
28	DB 28 35 16 P	28	35	16	-	15200	26400	14200	29.00	-	34.972	28.02	28.041
28.2	DB 90 056 PEE††	28.2	35.2	13.5	-	6000	8100	4000	20.00	-	35.172	28.22	28.241
30	DB 30 37 12 P	30	37	12	-	11200	18200	13000	30.12	-	36.972	30.02	30.041
	DB 30 37 16 PEE††	30	37	16		10800	17400	6500	28.20		36.972	30.02	30.041
	DB,DBF 30 37 20 P	30	37	20	18.5	20900	39000	13000	38.00	42.00	36.972	30.02	30.041
	DB,DBF 30 20	30	38	20	18.5	22300	37800	13000	45.00	50.00	38	30.015	30.041
	DB 30 40 30 P	30	40	30	-	36000	59800	13000	84.94	-	39.972	30.02	30.041
35	DB 35 42 12 P	35	42	12		11600	19300	11400	34.00		41.972	35.025	35.05
	DB 35 42 16 P	35	42	16	-	17400	32400	11400	35.00		41.972	35.025	35.05
	DB 35 42 20 P	35	42	20	-	22600	45500	11400	41.47		41.972	35.025	35.05
	DB 35 20	35	43	20		23900	43500	11400	48.00		43	35.015	35.041
	DB 35 43 24 PEE††	35	43	24		24100	43800	5700	55.50		42.958	35.025	35.05

* This inspection renders a bush unfit for further use
** Needle Bush with seal on one end
† Closed end type Needle Bush with Seal
†† Needle Bush with seal on both ends

Needle Bushes with Caged-Guided Needle Rollers (Metric sizes)

Type DB, DB…P
DBF, DBF…P
DB….E, DB…PE



DB,DB...P DBF,DBF...P DB...E,DB...PE

Shaft dia	Designation	Ci	Ce	L	f min	Basic capacities Dynamic C	Basic capacities Static Co	Limiting speed (oil)	Approx weight DB	Approx weight DBF	Inspection Gauges* Ring bore	Inspection Gauges* Go Plug	Inspection Gauges* NO Go Plug
m m		m m	m m	m m	m m	Newtons	Newtons	rpm	gms	gms	m m	m m	m m
35.5	DB 90 077 PTN	35.5	60	17.5		47200	50300	11000			59.967	35.57	35.595
40	DB,DBF 40 47 20 P	40	47	20	18.5	23200	49000	10000	49.00	56.00	46.972	40.025	40.05
	DB,DBF 40 20	40	48	20	18.5	26200	51000	10000	55.00	63.00	48	40.015	40.041
45	DB,DBF 45 52 16 P	45	52	16	14.5	19000	39600	9000	43.00	53.00	51.967	45.025	45.05
	DB,DBF 45 52 20 P	45	52	20	18.5	25800	58600	9000	54.00	64.00	51.967	45.025	45.05
	DB,DBF 45 20	45	52	20	18.5	25800	58600	9000	54.00	64.00	52	45.015	45.041
47	DB,DBF 47 16	47	55	16	14.5	21600	41900	8500	50.00	61.00	55	47.015	47.04
50	DB,DBF 50 58 20 P	50	58	20	18.5	29600	64300	8000	70.00	83.00	57.967	50.025	50.05
	DBF 90 054	50	58	26		25300	54200			90.15			
	DB 90 055 E**	50	58	25		25300	54200		118.00				

* This inspection renders a bush unfit for further use